

APPLICATION
FOR
UNITED STATES LETTERS PATENT
ENTITLED

METHODS AND SYSTEMS FOR NETWORKED CAMERA CONTROL

TO WHOM IT MAY CONCERN:

BE IT KNOWN THAT (1) Peter A. Mottur and (2) Ethan Z. Zimmer
of (1) 430 Black Point Lane, Portsmouth, RI 02871 and (2) 89
Overhill Road, East Greenwich, Rhode Island, 02818, invented
certain new and useful improvements entitled as set forth above
of which the following is a specification:

PATENT GROUP
FOLEY, HOAG & ELIOT LLP
ONE POST OFFICE SQUARE
BOSTON, MA 02109-2170
TEL: 617-832-1000
FAX: 617-832-7000

Docket No.: LVO-001.01

METHODS AND SYSTEMS FOR NETWORKED CAMERA CONTROL

CLAIM OF PRIORITY

This application claims priority to U.S.S.N. 60/221,674, entitled "Systems And Methods For Delivering Live Action Feeds Over A Computer Network", filed on July 26, 2000, naming Peter Mottur and Ethan Z. Zimmer as inventors, the contents of which are herein incorporated by reference in their entirety.

BACKGROUND

(1) Field

The disclosed methods and systems relate generally to delivering content over a computer network, and more particularly to providing content related to live action feeds controlled over the network by network users.

(2) Description of Relevant Art

The internet provides a platform for allowing the distribution of information and data such as multimedia data. Accordingly, one internet application includes broadcasting multimedia entertainment and other live action programming. Several internet websites exist that allow users to obtain live action programming that can be streamed throughout the internet to internet users. These websites can be integrated with one or more cameras, otherwise known as "webcams," that can be located

1 at locations to capture a particular field of view. Internet
2 users having an internet browser with the necessary plug-ins or
3 software applications, can receive the broadcast image data from
4 the fixed camera locations. For example, websites can include
5 points of views for major landmarks or other central locations in
6 various cities to allow internet users to view the weather or
7 scenery in the camera field of view. Other websites can utilize
8 the fixed field of view to capture, for example, commonly
9 congested traffic areas. Unfortunately, in the latter example,
10 there could be a traffic problem at another area on a given day,
11 that is not within the field of view. The information or data
12 provided from the fixed field of view therefore may not provide
13 sufficient information to a user on a given day. In other
14 applications, a camera can be used to view or monitor a moving
15 subject. If the subject moves outside the camera field of view,
16 the monitoring user may not be able to perform the monitoring
17 function. Some systems provide limited control of camera motion,
18 but such control can be particular to a specific individual,
19 user, and/or network location or device, and such control can
20 also be extremely limited to discrete camera movements.
21 Furthermore, many multimedia broadcasts include significant
22 delays between image updates, resulting in choppy broadcasts that
23 can appear to be, or may be, a string of static images that are
24 presented with a discernible delay between successive images.

SUMMARY

1 The disclosed methods and systems provide control of at
2 least one camera to at least one network user. The camera(s) and
3 network users can be in communication with each other through a
4 network including the internet or a public or private network.
5 The network users can utilize a microprocessor-controlled device
6 that includes or displays an interface, including a graphical
7 user interface (GUI), database or scripting interface, menu
8 driven interface, etc., that can be collectively referred to
9 herein as an interface. The interface can provide data from
10 which camera control commands can be generated and transferred to
11 the camera. Additionally, the camera can provide video (and
12 audio) data for display or presentation to the network user. The
13 audio/video data can be provided in real-time using uncompressed
14 analog or digital streaming modes/formats to provide continuous
15 feedback to the network user.

16 The connection between the network user and the camera(s)
17 can facilitate communications via fiber optic, infrared,
18 satellite, Radio Frequency (RF), microwave, cable, or Internet
19 Protocol (IP), or other communications modes and/or protocols.

20 The interface can be provided by an applet or an
21 application. In one embodiment, the interface can have a control
22 area that can have a cursor within the control area. Movement of
23 the cursor within the control area can be translated to camera
24 controls. For one embodiment, the control area can be calibrated
25 such that continuous commands can be provided to the camera based
26 on the cursor position while the cursor is active. In one

embodiment, while the cursor is active, pan and tilt commands can be provided to the robotic pan/tilt head to which the camera is mounted, connected, or otherwise in communications. When the cursor is inactive, camera commands may not be provided to the camera. The interface can also have options for adjusting focus and zoom.

In some embodiments, control commands can be mapped or otherwise associated with keyboard features including keys, and/or other peripheral devices including joysticks, control panels, and touchscreens, using, for example serial cables (RS-232, 422, 485), Universal Serial Bus (USB), FireWire, other communications protocols and/or devices.

The disclosed methods and systems also include at least one queue for administering control between the network users and the cameras. Network users can request control of a camera, and depending upon whether the network user is a subscriber or non-subscriber, the network user can be provided or otherwise associated with a camera control time interval, and placed in the queue. Camera control can be determined from the queue position, with a single user having control of a camera at a given time, and for a given time interval that can be equal to the camera control time interval associated with the user.

In some embodiments, a system administrator can establish the control intervals for subscribers and non-subscribers. A system administrator can also provide conditions or rules by which queue position can be determined. Furthermore, a system

1 administrator can usurp control of the camera, remove a user from
2 the queue, and deny a request from a user by preventing a user
3 from obtaining position in a queue.

4 Other objects and advantages will become apparent
5 hereinafter in view of the specification and drawings.
6

7 BRIEF DESCRIPTION OF THE DRAWINGS

8 FIG. 1 is a block diagram presenting features of the methods
9 and systems disclosed herein;

10 FIG. 2 is a diagram of one embodiment for television
11 broadcasting;

12 FIG. 3 displays an alternate embodiment for the methods and
13 systems;

14 FIG. 4 presents one user interface for control of a
15 camera(s); and,

16 FIGS. 5A and FIG. 5B present illustrative interfaces for
17 providing queue status and control.
18

19 DESCRIPTION

20 To provide an overall understanding, certain illustrative
21 embodiments will now be described; however, it will be understood
22 by one of ordinary skill in the art that the systems and methods
23 described herein can be adapted and modified to provide systems
24 and methods for other suitable applications and that other
25 additions and modifications can be made without departing from
26 the scope of the systems and methods described herein.

1 For the purposes of the disclosed methods and systems,
2 references to a camera can include references to a camera system
3 that can include a robotically controlled camera and a robotic
4 pan/tilt head to which the camera can be connected, and a
5 processor that can control camera features including white/black
6 balance, iris, gain, RGB, phase, timing, SC, and other like
7 features that can be collectively referred to herein as camera
8 presets. In some embodiments, the camera includes a pan/tilt
9 head, while in other embodiments, the pan/tilt head can be
10 separate from the camera. Accordingly, in some embodiments,
11 references to camera as provided herein, can include references
12 to one or more processors (e.g., processor associated with the
13 camera and a processor associated with pan/tilt head; one
14 processor for the camera and the pan/tilt head, etc.).

15 The disclosed methods and systems include methods and
16 systems for providing real-time continuous streaming video and
17 audio data from at least one remote camera system and/or
18 location, to network users on a network such as the internet an
19 another public or private network. Furthermore, the methods and
20 systems allow the network users to interactively control the
21 cameras using continuous control methods and systems, wherein
22 continuous camera control can be understood herein to include
23 control commands provided at fixed intervals. The network users
24 can control camera pan, tilt, zoom, focus, and camera presets
25 using, in one embodiment, a user interface in the form of a
26 control or touch pad. In some embodiments, focus and zoom

controls can be provided using "rocker" type buttons on the user interface that have up/down or +/- controls. In another embodiment, for example, slider controls can be used for variable speed control, and such examples are provided for illustration and not limitation. The pan, zoom, focus, and tilt controls can be fluid controls to allow control commands to be provided to the camera(s) in a continuous manner as provided herein, for fluid camera movement. The methods and systems can be employed in television or network broadcast, cable, satellite, wireless, and/or broadband applications, thereby enabling user interactivity over network/internet connections, digital or analog set-top boxes, and/or handheld wireless remote control devices. In some embodiments, the methods and systems also provide user queuing techniques to allow shared and ordered control of the cameras by the network users. Administrative usurping of camera control from network users can be allowed.

The methods and systems herein are not limited to the communication channel by which the camera control and/or video/audio streaming data can be communicated. Although examples of communications channels can include fiber optic, infrared, satellite, Radio Frequency (RF), microwave, cable, Internet Protocol (IP), etc., such examples are provided for illustration and not limitation.

Referring now to FIG. 1, there is an architectural block diagram 10 providing features for the methods and systems disclosed herein. Those with ordinary skill in the art will

1 recognize that FIG. 1, and other figures provided herein, can be
2 provided for discussion purposes to illustrate features of the
3 disclosed methods and systems. Accordingly, it can be understood
4 that such features or parts thereof, unless otherwise noted, can
5 be combined, further expanded upon with additional detail, and/or
6 otherwise eliminated, without departing from the scope of the
7 methods and systems.

8 FIG. 1 presents a system that includes a regional
9 distribution center 12 that can otherwise be understood as a
10 Network Operating Center (NOC). The center 12 can include one or
11 more encoders 14a, 14b, that can accept uncompressed audio-video
12 input from one or more cameras 16a-16f. The encoder outputs can
13 be input to an Internet Video Streaming (IVS) web server 18 and a
14 Direct Television (SDI/DTV) or MPEG (MPG) video server 20. The
15 servers 18, 20 can communicate with a point-of-presence (POP)
16 server 22 to distribute audio-visual data from the cameras 16a-
17 16f using IVS 24, MPEG (MPG) 26, or MPG/DTV 28 audio-video
18 formats. The audio-video formats can additionally be compatible
19 with Real Networks, Windows Media Player, Quicktime, MPEG-2,
20 etc., where such examples are provided for illustration and not
21 limitation. The audio-visual data from the cameras 16a-16f can
22 additionally and optionally be presented to a video switcher 30
23 and thereafter to a telephone communications provider or
24 television company 32 that can distribute compressed or
25 uncompressed audio-video data for broadcast in a format that can

1 include analog or digital television (SDI/DTV), including high-
2 definition digital television (HDTV) 34.

3 The FIG. 1 cameras 16a-16f can include, for example,
4 robotically controlled cameras that can be commercially available
5 from manufacturers including Panasonic, Sony, Canon, Pelco,
6 Hitachi, Fujinon, Phillips, JVC, and Sensormatic, with such
7 examples provided merely for illustration and not limitation. As
8 indicated previously, the cameras 16a-16f can communicate
9 uncompressed audio and video data to the center 12 using fiber
10 optic cable, for example. The encoders 14a, 14b can encode the
11 uncompressed video data for presentation to the servers 18, 20
12 that can thereafter distribute the data over a network or other
13 communications link. Although the illustrated encoders 14a, 14b
14 receive inputs from multiple cameras 16a-16f, other embodiments
15 can include a one-to-one relationship between encoders 14a, 14b
16 and cameras 16a-16f.

17 The illustrated web server 18 can be equipped with software,
18 hardware, or a combination thereof, that can convert the data for
19 compatibility with MPEG 1/2/4, JPEG, M-JPEG, RTP, RTSP, or Java
20 Media Framework (JMF), or other formats that can be compatible
21 with, for example, a Quick Time server, a Real Player server, a
22 Windows Media server, or another server that can deliver audio-
23 video data over a network.

24 The illustrated video server 20 can also compress the
25 uncompressed audio-video data from the encoders 14a, 14b, to
26 allow a format suitable for delivery over a network. As FIG. 1

1 illustrates, the POP server 22 can receive data from either the
2 web server 18, the video server 20, or both.

3 The illustrated servers 18, 20, 22 can be one or more
4 microprocessor-based systems including a computer workstation,
5 such as a PC workstation or a SUN workstation, handheld, palmtop,
6 laptop, personal digital assistant (PDA), cellular phone, etc.,
7 that includes a program for organizing and controlling the server
8 18, 20, 22 to operate as described herein. Additionally and
9 optionally, the server 18, 20, 22 can be equipped with a sound
10 and video card or device for processing multimedia data. The
11 server 18, 20, 22 can operate as a stand-alone system or as part
12 of a networked computer system. Alternatively, the server 18,
13 20, 22 can be a dedicated device, such as an embedded system,
14 that can be incorporated into existing hardware devices, such as
15 telephone systems, PBX systems, sound cards, etc. In some
16 embodiments, servers 18, 20, 22 can be clustered together to
17 handle more traffic, and can include separate servers for
18 different purposes such as a database server, an application
19 server, and a Web presentation server. The server 18, 20, 22 can
20 also include one or more mass storage devices such as a disk farm
21 or a redundant array of independent disks ("RAID") system for
22 additional storage and data integrity. Read-only devices, such
23 as compact disk drives and digital versatile disk drives, can
24 also be connected to the server 18, 20, 22. Additionally and
25 optionally, the client-server model is well known as a
26 relationship between a requester program, otherwise known as the

1 client, and the program that services the request, otherwise
2 known as a server 18, 20, 22. It is also well-known that the
3 client and server 18, 20, 22 can reside on the same device, and
4 such understanding can be applied to the disclosed methods and
5 systems and to FIG. 1, where the servers 18, 20, 22 can also be
6 viewed as clients in the client-server model. As used herein,
7 the term "server" is intended to refer to any of the above-
8 described servers.

9 For a system according to FIG. 1, data from the cameras 16a-
10 16f can be multiplexed and provide for lower bandwidth video that
11 can be viewed on conventional internet devices that can utilize
12 web browsers and/or at least one software application. The
13 multiplexed video data can be provided on-demand from the video
14 server 20 to data network users that, in one embodiment, utilize
15 Internet Protocol (IP). As indicated herein, the video data can
16 be distributed over private networks or public networks such as
17 the internet.

18 In some embodiments, the audio-video data from the cameras
19 16a-16f can be communicated using an intra-lata (local access
20 transport area) service that can otherwise be known as local
21 toll, regional, or zone service. The intra-lata service can also
22 be used for distributing the audio-video data from the center 12
23 to the network.

24 Referring now to FIG. 2, there is a system 40 for coupling
25 or integrating a kiosk 42 to the center or NOC 12 and thereafter
26 to a broadcaster 44 to exchange data between the kiosk and the

1 broadcaster 44. In the FIG. 2 system, an IP device 46 can couple
2 at least one internet user 48 to the broadcaster 44 to receive
3 audio-video data from the kiosk 42. The broadcaster 44 can
4 optionally and additionally transfer the data through a
5 television broadcast.

6 The FIG. 2 kiosk 42 can include a robotic camera as
7 described previously herein. Furthermore, the kiosk 42 can be
8 equipped with a video prompter, audio devices (microphones,
9 mixers, compressors, speakers, etc.), and a microprocessor-
10 controlled device that allows remote control of the camera,
11 lighting, LCD ticker, microphones, and other systems integrated
12 with the kiosk. Accordingly, the internet users 48 can interact
13 (i.e., via IP control) with the broadcast from the kiosk 42 by
14 controlling the camera via a control server 50. The control
15 server 50 can allow control by providing a graphical user
16 interface, for example, to the users 48 to allow the users 48 to
17 control the kiosk camera(s) and hence interact with the
18 television broadcast. The graphical user interface can be
19 provided, for example, using a Java applet or an application.

20 Referring now to FIG. 3, there is a block diagram 60 for
21 representing systems and methods that can be integrated with the
22 systems and methods of FIGs. 1 and 2. Those with ordinary skill
23 in the art will recognize that FIGs. 1, 2, and 3, and other
24 Figures provided herein, can provide similar features of varying
25 detail. Accordingly, as illustrated in FIGs. 2 and 3, the user
26 48 can be understood to include an initiating device 62 that can

1 include a digital computer system that can utilize a wired or
2 wireless communications link to connect to a communication
3 network such as the internet. The user(s) 48 of the initiating
4 device 62 can utilize different peripheral devices that can be
5 integrated with or otherwise configured for compatible use with
6 the initiating device 62. For example, the initiating device 62
7 can include a keyboard, keypad, stylus, joystick, digital camera,
8 microphone, etc., that can communicate data to the initiating
9 device using wired or wireless communications systems and/or
10 protocols, etc. The initiating device 62 can be a
11 microprocessor-based system including a computer workstation,
12 such as a PC workstation or a SUN workstation, handheld, palmtop,
13 laptop, personal digital assistant (PDA), cellular phone, etc.,
14 that includes a program for organizing and controlling the
15 initiating device 62 to operate as described herein.
16 Additionally and optionally, the initiating device 62 can be
17 equipped with a sound and video card for processing multimedia
18 data. The initiating device 62 can operate as a stand-alone
19 system or as part of a networked computer system. Alternatively,
20 the initiating device 62 can be a dedicated device, such as an
21 embedded system, that can be incorporated into existing hardware
22 devices, such as telephone systems, PBX systems, sound cards,
23 etc. Accordingly, it will be understood by one of ordinary skill
24 in the art that the initiating device 62 described herein has
25 wide applicability and can be incorporated in many systems, and
26 realized in many forms.

1 For a system according to FIG. 3, the initiating device 62
2 can be connected to a network such as the internet and can be
3 equipped with what is well-known as an internet "browser" such as
4 the commercially available Netscape Navigator, Internet Explorer,
5 etc., browsers, and those with ordinary skill in the art will
6 recognize that, depending upon the initiating device 62 and its
7 configuration, the browser can differ, and hence references
8 herein to a browser can include references to a user interface to
9 the internet or other network, wherein the methods and systems
10 herein are not limited to the browser or other network interface.

11 Furthermore, the initiating device 62 can access the internet
12 using wired or wireless communications links and/or protocols.

13 Referring again to FIG. 3, the user 48, via the initiating
14 device 62, can request information via a network from one or more
15 web servers 64, for example. The illustrated web server 64 can
16 include features that have previously been described in relation
17 to the NOC 12 and the control server 50. Additionally and
18 optionally, the web server 64 can include one or more applets
19 and/or applet tags 66 that can cause an applet on the web server
20 64 or another server (or web server) to be communicated or
21 otherwise available to the initiating device 62. For the methods
22 and systems disclosed herein, an applet or applet tag 66 can
23 provide at least one interface that, in the illustrated
24 embodiments is a graphical user interface (GUI), for display on
25 the initiating device 62. Those with ordinary skill in the art
26 will recognize that the interface is not limited to an interface,

1 and can include, for example, database or scripting interface,
2 menu driven interface, etc., and accordingly references herein to
3 a or the interface can be understood to be references to an
4 interface that can operate according to the methods and systems
5 disclosed herein. For example, in a database interface, a camera
6 16 can be positioned at predetermined locations at corresponding
7 times.

8 In one embodiment of the FIG. 3 systems and methods, an
9 interface can be manipulated or otherwise controlled by the user,
10 and the control can be communicated to the camera(s) 16.

11 Furthermore, another applet 66, or additionally and optionally,
12 an application residing on the initiating device 62, can cause
13 the initiating device 62 to display or otherwise present
14 audio/visual data to the user 48 in a real-time continuous
15 streaming mode. The user 48 can, through the interface, control
16 the camera 16 with real-time continuous audio/visual feedback.

17 As indicated previously herein, in some embodiments, the web
18 server 64 can be a separate device or program from the control
19 server 50, the NOC 12, and other features of the web server 64.
20 For example, in an embodiment, the control server 50 and NOC 12
21 can be separate servers and can have separate processors that can
22 be in communication with the web server 64. Additionally and
23 optionally, the NOC features 12 and the control server 50 can be
24 integrated with the initiating device 62 or one or more
25 processors related to or otherwise associated with the camera 16.

26 Those with ordinary skill in the art will thus recognize that

1 there are various configurations of the FIG. 3 system that can be
2 employed without departing from the methods and systems provided
3 herein.

4 Referring now to FIG. 4, there is an illustration of one
5 interface that is a graphical user interface (GUI) 70 that can be
6 provided to the initiating device/user 62, 48 for controlling the
7 camera 16 according to a system of FIG. 3. The FIG. 4 interface
8 70 can be presented with a window or other presentation of
9 audio/visual data such that the user 48 can view audio/video data
10 based on the camera 16 positioning, as the user 48 controls the
11 camera 16.

12 The illustrated interface 70 includes a control pad or area
13 72 that includes an origin designation 74 that, in the
14 illustrated embodiment, is a "+", although other origin
15 designations can be used. The control pad also includes a cursor
16 76 that can be controlled by the user 48. For example, in one
17 embodiment, the user 48 can control the cursor 76 by dragging the
18 cursor with a mouse, stylus, joystick, or other peripheral device
19 that can be integrated according to the methods and systems to
20 control the cursor 76. In other embodiments, the cursor 76 can
21 be directed using voice commands or by utilizing an interface
22 that otherwise allows the cursor 76 to be positionally directed
23 within the control area 72. In the illustrated embodiment, the
24 illustrated cursor 76 cannot leave the control area 72.

25 The illustrated interface 70 can be calibrated or otherwise
26 configured such that when the cursor 76 is placed at the origin

74, the camera position remains fixed. Accordingly, for the illustrated interface 70, the control area 72 can be understood to be continually relative to the current camera position. Consequently, as the cursor moves from the origin 74, corresponding control commands can be generated and provided to the camera 16 to allow continuous camera control and fluid camera positional movement in the pan and tilt directions. These directions can also be referred to as range and azimuth, or x and y, and the disclosed methods and systems are not limited to a choice of coordinate system or axes representation or labeling.

For purposes of discussion herein, camera 16 control can be referred to as pan and tilt, where pan can be understood to be left-right camera motion, while tilt can be understood to be camera up-down motion. With regard to the illustrated control area 72, the control area 72 can be described with reference to the cartesian coordinate system, such that left-right cursor 76 motion can be referred to herein as motion in the "x" direction, while up-down (tilt) movement can be referred to herein as cursor motion in the "y" direction. Accordingly, for the illustrated control area 72, cursor 76 movement solely in the x direction, along the x-axis origin 74, translates to panning the camera 16 with increased magnitude (speed) as the distance from the origin increases. Similarly, for the illustrated control area 72, cursor 76 movement solely in the y direction, along the y-axis origin 74, translates to tilting the camera 16, with increased magnitude (speed) as the distance from the origin increases.

1 Furthermore, moving the cursor 76 in both the x and y directions
2 translates to camera 16 control in both the pan and tilt
3 directions.

4 The illustrated control area 72 can be calibrated such that
5 distance from the origin 74 in the x and y directions can be
6 translated into corresponding pan and tilt camera control
7 commands. The calibration and camera control commands can be
8 based on the camera 16, camera 16 type, camera interface, etc.
9 For example, in some embodiments, the control area 72 can be
10 understood to include a grid where the cursor 76 movement can be
11 measured based on the grid position. The grid may or may not be
12 visible to the user 48 via the interface 70.

13 For the illustrated systems and methods, camera control is
14 only provided when the cursor 76 is activated. As an example,
15 consider that a user "activates" the cursor 76 in the control pad
16 area 72 by selecting the cursor 76 with a computer mouse, and
17 subsequently drags the cursor 76 to a position that can be viewed
18 as one unit in the x-direction, and two units in the y-direction.

19 Based on the cursor 76 position, pan and tilt commands, or the
20 equivalent thereof, can be provided to the camera 16 (camera
21 driver(s)) based on the x and y cursor positioning. In some
22 embodiments that can be dependent upon the camera 16, camera
23 commands can be provided for diagonal movement of the camera 16,
24 or incremental pan and tilt movements can be provided to the
25 camera 16 to achieve the desired positioning. For the
26 illustrated systems and methods, should the user 48 maintain an

1 active cursor 76 at a fixed, non-origin position, camera commands
2 of the same magnitude and in a continuing process can be
3 transmitted to the camera 16. Alternately, in the illustrated
4 embodiments, when the user 48 "deactivates" or inactivates the
5 cursor 76 in the control pad area 72, including releasing a
6 computer mouse button, the illustrated cursor 76 can return to
7 the origin 74, thereby ceasing the transmission of control
8 commands to the camera 16. In an embodiment, deactivation of the
9 cursor 76 can cause the transmission of a "stop" command to the
10 camera 16. In some embodiments, deactivating the cursor 76 can
11 cause the camera 16 to receive pan and tilt commands that do not
12 provide any camera 16 movement. Accordingly, one of ordinary
13 skill in the art will recognize that cursor positioning at the
14 origin 74 can provide an option to cease camera control command
15 transmission, or can equivalently cause camera control commands
16 to be transmitted that cause no camera 16 movement. Different
17 camera control commands can be generated from the illustrated
18 interface 70, and in particular, the cursor 76 position,
19 depending upon camera 16 and other system requirements.

20 Accordingly, for the illustrated interface 70, the further
21 the distance of the cursor 76 from the origin 74, the greater the
22 magnitude of the camera control commands. In one embodiment, if
23 camera control commands are provided in a continuous manner, at
24 fixed intervals such as once every millisecond, based on the
25 cursor 76 position, greater magnitude commands can translate into
26 more rapid camera movement as the camera 16 can attempt to move a

1 greater distance in the same one millisecond command interval.
2 As indicated herein, the maximum camera control commands for one
3 camera 16 can be different from the maximum camera control
4 commands for another camera 16, and hence the interface 70 can be
5 calibrated accordingly. In some embodiments, the same interface
6 calibration can be used for multiple cameras, with the
7 calibrations performed as the cursor position is translated to
8 camera commands.

9 As FIG. 4 also indicates, the interface 70 can include
10 options for focusing 78 and zooming 80 the camera 16. Because
11 the illustrated focus 78 and zoom 80 features are not included in
12 the illustrated control area 72, utilization of such features
13 implies that the control pad cursor 76 is deactivated or
14 inactivated and hence positioned at the origin 74, thereby
15 indicating a non-mobile camera 16. Although the illustrated
16 interface 70 does not include a visible cursor for the focus 78
17 and zoom 80 areas, it can be understood that a cursor can be
18 activated for those areas 78, 80 when the user 48 depresses a
19 button in the illustrated regions 78, 80 or otherwise causes the
20 focus 78 and/or zoom 80 features to be enabled. For one
21 embodiment using the illustrated interface 70, depressing a
22 computer mouse button in the focus or zoom areas 78, 80 can be
23 understood to be cursor activation, while releasing the computer
24 mouse button can be understood to be cursor inactivation. In
25 some embodiments, dual control of the cursor 76 and focus 78
26 and/or zoom 80 features can be available, and in some

embodiments, the focus 78 and/or zoom 80 features can be combined with the features of the control pad 72.

Although not illustrated in FIG. 4, an interface or GUI for the disclosed methods and systems can include controls for camera presets, previously defined herein as camera settings or features that can include white/black balance, iris, gain, RGB, phase, timing, SC, and other like features.

As indicated previously, continuous camera control can be understood herein to include control commands that can be transmitted to the camera at fixed intervals for a given time period. For example, as previously provided, camera commands can be transmitted to the camera 16 while the cursor 76 is active, and such commands can be sampled and/or transmitted at a rate of once per millisecond. As also indicated herein, control commands can vary, and can include, for example, pan, tilt, focus, zoom, camera presets, or combinations thereof. Accordingly, in one embodiment of the methods and systems herein, the given time interval during which control commands can be generated can be, for example, the time period during which the cursor 76 is active. As indicated herein, for the illustrated interface 70, the cursor can be active in the control pad area 72, or while operating the focus 78 and/or zoom 80 features.

The illustrated interface 70 also includes a location preset camera positioning option 82 such that a user can designate a fixed camera position for future retrieval. The illustrated interface 70 thus provides a drop-down box 82 that can retrieve

1 previously defined or stored camera positions. Selections of the
2 predefined positions can cause appropriate camera commands to be
3 transmitted to the camera 16, to cause the camera 16 to be
4 positioned at the desired, specified, and predefined position or
5 location.

6 The FIG. 4 interface 70 also provides an option to exit 84.

7 When a user 48 selects the illustrated exit option 84, the user
8 48 relinquishes control of the camera 16. In some embodiments,
9 exit 84 selection can cause the interface 70 to be eliminated
10 from the user's display, while in other embodiments, exit 84
11 selection merely causes the user to relinquish camera control.

12 As indicated previously herein, the methods and systems
13 include features for allowing more than one user 48 to control a
14 camera 16 over a network interface. The illustrated methods and
15 systems can implement a dynamic queuing feature that can
16 facilitate the shared control. In the illustrated systems as
17 provided in FIGs. 3 and 4, users 48 can subscribe to or otherwise
18 register with the web server 64 or control server 50. Such users
19 48 can, for example, be provided user names, accounts, passwords,
20 and login information such that when the registered users 48
21 access the web server 64, the users can be recognized as a
22 subscriber or registrant. The methods and systems disclosed
23 herein can also make features available to a system administrator
24 of the web server 64 or the control server 50 that can allow the
25 server(s) 64, 50 to provide designated features, capabilities, or
26 privileges to subscriber users 48. Alternately, a system

1 administrator can configure the methods and systems such that
2 non-subscriber users 48 may not be afforded or provided such
3 privileges. Accordingly, the methods and systems can allow
4 camera control options for subscriber users (e.g., pay-per-view
5 access), non-subscriber users, and system administrators.

6 In one embodiment of the illustrated systems and methods,
7 subscriber users can be provided priority regarding camera
8 control. Accordingly, for the illustrated embodiments, a camera
9 16 can be controlled by only one user 48 at a single time.
10 Requests for camera control can hence be initiated by a user 48
11 and received by the web server 64, for example. Based on the
12 user's status as a subscriber or non-subscriber, the web server
13 64 can generate a camera control queue that provides priority to
14 subscriber users 48. Camera control can be for a specified time
15 interval, and camera control intervals for subscribers can be
16 different than camera control intervals for non-subscribers. In
17 some embodiments, camera control intervals can be based on the
18 number of requests. In an embodiment, camera control intervals
19 can be based on subscriber fees. Camera control interval
20 features can be configured by a system administrator.

21 Those with ordinary skill in the art will recognize that
22 there are various systems and methods for managing queues, and
23 such methods and systems can be designated by a system
24 administrator based on system requirements. In one embodiment,
25 non-subscriber requests may only be processed after subscriber
26 requests are fulfilled. Additionally and optionally, subscriber

1 camera control time intervals can be longer than non-subscriber
2 intervals. Once a camera control time interval expires, the user
3 48 can be automatically re-entered into the camera control queue.

4 Alternately, a user 48 who terminates (e.g., "exit" 84) the
5 camera control interval before expiration may not be re-entered
6 into the queue.

7 In some embodiments, subscriber requests may only take
8 precedence over non-subscriber requests at predefined times. In
9 an embodiment, the system administrator can usurp control of the
10 camera 16 from a user 48. Once the system administrator
11 relinquishes camera control, the requests for queuing can be
12 processed based on the queue status before the system
13 administration usurpation. A camera control interval associated
14 with the user 48 from which control was usurped by the system
15 administrator, can be suspended such that when the system
16 administrator relinquishes control, the user 48 from which camera
17 control was usurped can be credited with control and the
18 remaining camera control interval before the usurping.

19 In some embodiments, system administrators can remove a user
20 from the queue, and/or permanently deny a user of privileges.
21 Furthermore, a system administrator can usurp control from a
22 user, and thereafter prevent the camera control from returning to
23 that user. In an embodiment, system administrators do not have
24 time limits on camera control.

25 In some embodiments, users 48 can be provided with a display
26 of the current camera control user's remaining camera control

1 time interval. Such display can be represented as a reverse
2 stop-watch display. Users 48 can also be presented with a
3 display of the camera control queue order, where users can be
4 identified by login name or other specified identity data. Such
5 data can influence a user 48 to request control of one camera 16
6 in contrast to requesting control of another camera 16 that may
7 have more requests.

8 An illustration of one display method or interface for the
9 methods and systems herein can be seen in FIGS. 5A and 5B. FIG.
10 5A displays an interface 90 wherein the user in control of the
11 camera 16 is called the "driver", and is identified as Guest_52.

12 The user being shown the display is known as Guest_58, and a
13 queue status display 92 can indicate the current driver and the
14 queue status that includes three parties, the associated queue
15 order for camera control for the three parties, and the time
16 allotted for the three parties. The display 90 also includes the
17 status of the current driver's time interval, and an option 94 to
18 allow the present user (i.e., Guest_58) to enter the queue.

19 FIG. 5B presents an interface 96 that allows a user to exit
20 the queue. The FIG. 5B an interface 96 is similar to the FIG. 5A
21 interface 90 and provides a queue status area 98 and a user-
22 selectable option to exit from the queue 100.

23 When a user in the queue becomes the driver and is provided
24 camera control, the driver can be provided with both visual and
25 audio indications of such status. For example, in one
26 embodiment, the new driver can be provided an audio signal such

1 as a beep. Additionally and optionally, the driver's interface
2 and/or display can be altered to indicate control mode versus
3 queue mode.

4 For the illustrated systems and methods, a chat feature can
5 be simultaneously provided on the display that includes the
6 audio-visual data from the camera 16. Users can accordingly
7 share comments and other data via the chat feature. The chat
8 feature(s) can allow real-time chat and can be implemented using
9 an applet or applet tag 66 that can be located on the web server
10 64. Based on the disclosed methods and systems, chat features
11 can be provided to internet users, television users, and other
12 system users.

13 The disclosed methods and systems can also be utilized to
14 allow the transmission, broadcast, and/or webcast of live
15 performances, or commercials, that can be understood herein as
16 LiveMercials. In one embodiment of LiveMercials, an advertiser
17 or sponsor can purchase or otherwise negotiate media space and/or
18 time on a network that utilizes the disclosed methods and
19 systems. The advertiser can determine the location and/or camera
20 from which to collect the audio/visual data, the target audience
21 to receive the collected data, the time to collect and/or
22 broadcast or distribute the data, and the format for the
23 audio/video data distribution. In some embodiments, audience
24 members can participate on-site and/or on-line using a real-time
25 ratings system that can provide real-time feedback from the

audience to the advertiser. As disclosed herein, a LiveMercial can include audio and visual data.

In one example of LiveMercials, live auctions can be performed by allowing products and/or services to be presented for bidding by real-time, on-site and/or on-line audience members.

Those with ordinary skill in the art will recognize that the methods and systems disclosed herein can be platform independent and can operate using a variety of operating systems. As indicated previously, the methods and systems can also be independent of the camera. As indicated herein, in some embodiments, a user can be provided with a choice of cameras from which to select, wherein the several cameras can be positionally distinct.

What has thus been described are methods and systems for providing fluid real-time camera control of at least one camera to at least one network user via a network including the internet. A control pad or area can be provided to camera users via an application or applet that can be calibrated to provide fluid camera control. Compressed or uncompressed analog, digital, or streaming video and audio data can also be provided to the users to allow real-time low latency continuous audio/visual feedback. Multiple camera users can obtain control of a camera using a dynamic queuing technique that can allow single user camera control for certain time intervals. An administrator can establish user camera control parameters

1 including camera control intervals for subscriber users versus
2 non-subscriber users, camera usurping by an administrator,
3 elimination of camera control privileges for a user, and denial
4 of camera control requests by a user.

5 The methods and systems described herein are not limited to
6 a particular hardware or software configuration, and may find
7 applicability in many computing or processing environments. The
8 methods and systems can be implemented in hardware or software,
9 or a combination of hardware and software. The methods and
10 systems can be implemented in one or more computer programs
11 executing on one or more programmable computers that include a
12 processor, a storage medium readable by the processor (including
13 volatile and non-volatile memory and/or storage elements), one or
14 more input devices, and one or more output devices.

15 The computer program(s) is preferably implemented using one
16 or more high level procedural or object-oriented programming
17 languages to communicate with a computer system; however, the
18 program(s) can be implemented in assembly or machine language, if
19 desired. The language can be compiled or interpreted.

20 The computer program(s) can be preferably stored on a
21 storage medium or device (e.g., CD-ROM, hard disk, or magnetic
22 disk) readable by a general or special purpose programmable
23 computer for configuring and operating the computer when the
24 storage medium or device is read by the computer to perform the
25 procedures described herein. The system can also be implemented
26 as a computer-readable storage medium, configured with a computer

1 program, where the storage medium so configured causes a computer
2 to operate in a specific and predefined manner.

3 Although the methods and systems have been described
4 relative to a specific embodiment thereof, they are not so
5 limited. Obviously many modifications and variations may become
6 apparent in light of the above teachings. For example, as
7 indicated previously herein, multiple cameras can be controlled
8 by a single user, and the multiple cameras can be of different
9 types with different connections (wired, wireless, satellite,
10 infrared, laser, etc.) between the user and the camera or
11 intermediate elements between the user and camera(s). Although
12 the interface presented herein for camera control included a GUI
13 with a cursor, other interfaces can be utilized that do not
14 utilize a cursor for camera control, and can use other graphics
15 or schemes to provide and/or demonstrate control features.
16 Although the illustrated interface included an origin designation
17 in the center of the interface, the origin can be at a different
18 location in the interface. Furthermore, in some embodiments, an
19 origin designation may not be included, and cursor activation can
20 occur by, for example, clicking a computer mouse in the control
21 area. Although the illustrated interface also included buttons
22 for increasing and decreasing focus and zoom, other methods for
23 generating focus and zoom commands can be provided. The user
24 interface can be, for example, text-based or menu driven in some
25 embodiments, rather than graphical.

